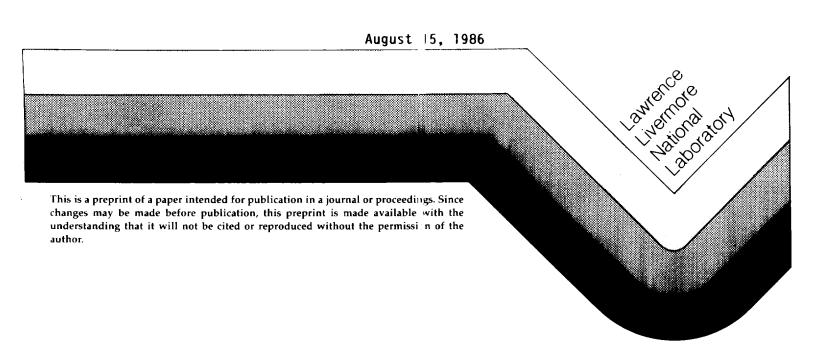# THE Be-Np (BERYLLIUM-NEPTUNIUM) SYSTEM

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DISCLAIMER

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9.01218   237.048

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Equilibrium Diagram

The melting point of βBe and the $\beta Be \longrightarrow \alpha Be$ allotropic transformation temperature are 1289 ± 4 and 1270 ± 6 °C, respectively [86BAP].
The melting point of γNp and the $\gamma Np \longrightarrow \beta Np \longrightarrow \alpha Np$ allotropic transformation temperatures are 639, 576, and 280 °C, respectively [85War].

An X-ray diffraction study of [54Run] showed that only one intermediate phase, $Be_{13}Np$, exists in the Be-Np system. $Be_{13}Np$ did not melt on heating to 1400 °C [54Run]. This phase was considered to have some homogeneity range because the lattice parameter varied in samples of different composition [54Run].

Crystal Structures

The crystal structure and lattice parameter data are given in Table 1.
The structure of $Be_{13}Np$ is isomorphous to $NaZn_{13}$ [54Run]. The observed contraction of $Be_{13}Np$ on the Np-rich side may be due to formation of a Be defect structure [54Run].

Cited References

*54Run: O.J.C. Runnalls, "The Intermetallic Phase NpBe₁₃", _Acta Crystallogr._, _7_, 222-223 (1954). (Equi Diagram, Crys Structure; Experimental)
84Ste: G.R. Stewart, Z. Fisk, J.L Smith, J.O. Willis, and M.S. Wire, "New Heavy-Fermion System, $NpBe_{13}$, with a Comparison to UBe_{13} and $PuBe_{13}$", _Phys. Rev. B_, _30_(3), 1249-1252 (1984). (Crys Structure; Experimental)
85War: J.W. Ward, P.D. Kleinschmidt, and D.E. Peterson, "Thermochemical Properties of the Actinide Elements and Selected Actinide-Noble Metal Intermetallics," _Handbook of the Physics and Chemistry of the Actinides_, (ed.) C. Keller and A. Freeman, North-Holland, Amsterdam (1985). (Equi Diagram; Review)
86BAP: to be published in _Bull. Alloy Phase Diagrams_, (1986). (Equi Diagram; Compilation)

* Indicates key paper.

General References

[King1]: H.V. King, "Crystal Structures of the Elements at 25 °C", <u>Bull. Alloy Phase Diagrams</u>, <u>2</u>(3), 401-402 (1981)
[King2]: H.V. King, "Temperature-Dependent Allotropic Structures of the Elements", <u>Bull. Alloy Phase Diagrams</u>, <u>3</u>(2), 275-276 (1982)

Acknowledgements

Table 1   Be-Np Crystal Structure and Lattice Parameter Data

Phase	Composition, at.% Np	Pearson symbol	Struktur-bericht designation	Space group	Proto-type	Lattice parameters, nm a	b	c	Reference
(βBe).....	0	cI2	A2	Im3m	W	0.25515	...	...	[King2]
(αBe).....	0	hP2	A3	P6₃/mmc	Mg	0.22857	...	0.35839	[King1]
Be₁₃Np...~	7.14(a)	cF112	D2₃	Fm3c	NaZn₁₃	1.0266	...	...	[54Run]
	(b)					1.0256	...	...	
	7.14					1.0267	...	...	[84Ste]
(γNp)...	100	cI2	A2	Im3m	W	0.352	...	...	[King2]
(βNp)...	100	tP4	Aₐ	P42₁2	βNp	0.4896	...	0.3387	[King2]
(αNp)...	100	oP8	Aₑ	Pnma	αNp	0.6663	0.4723	0.4887	[King1]

(a) Be-rich.   (b) Np-rich.

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